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Prof. C. F. Hodge

NATURE STUDY LEAFLET.

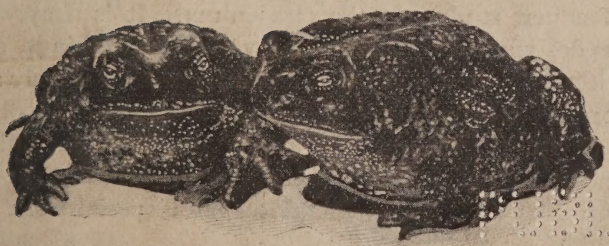
By
C. F. HODGE, PH. D.,
CLARK UNIVERSITY,
Worcester, Mass.

BIOLOGY SERIES,
No. 1.

THE COMMON TOAD.

SUGGESTIONS FOR

THE STUDY OF ITS LIFE STORY AND ITS LIFE WORK.



Male. Female.

WORCESTER, MASS.:
PRESS OF O. B. WOOD.
1898.

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Prof. C. F. Hodge
Oct. 25, 1899

BIOLOGY OF THE COMMON TOAD.

(Bufo lentiginosus americanus LeC.)

By C. F. HODGE, Ph. D., Assistant Professor of Physiology, Clark University.

Biology is defined as "the science of living things in the widest sense." Thus the biology of any animal is a knowledge of its whole life story, its activities, all its relations to food supply, to enemies that feed upon it, its relations to mankind and to human interests. It is not zoology, not botany, not anatomy, not physiology. It includes and is greater than all these, and when this science is complete for any animal, it will tell us just what part it plays in the economy of nature, the whole work which the species does in the world.

We need this word, biology, in elementary school work, and there should be associated with it no suggestion of the introduction of a new study into the curriculum. It is simply an easy word to designate the "nature study" of living things, and it is the writer's opinion that this wider study should largely supplant the more technical and special science work in our schools. This larger view must inspire life-long interests. These should be developed at the earliest practicable moment, and will thus form the well-spring of interest and energy for more special work later on in the child's course.

Scientific names have been given in parenthesis solely to facilitate reference to technical descriptions, where this may become desirable. They are thus added not to be "learned" but to be used. It must also be stated that the purpose of this leaflet is not so much to tell the story of the toad's life, what little we know

NOTE.—This leaflet is put out as an experiment in nature study on the sole responsibility of the writer. Its title, "Biology Series, No. 1," is distinctive as indicating his point of view; and if it is found to be of practical value and helpful to teachers and pupils, other numbers will follow on tree toads, frogs, bats, one of our fresh water fishes, and other of our common but little known and illy utilized creatures.

of it, as to point out the way the story may be read in living nature about us; and, not only that, but especially to emphasize the fact that the story may be filled out, the bounds of human knowledge widened by faithful observations even of a child.

The school room should be provided with some simple aquaria[1] and vivaria, or "live-boxes" where a few specimens can be kept in comfort, under conditions as similar as possible to those with which the animal seeks to surround itself outside. What these conditions are, must form an important part of the study. Then, as spring approaches, let the children bring in specimens of all the frogs and toads native to the locality. Select one or two of the best to study and return the rest to their native haunts.

The following list of genera and species is added not for the purpose of having the pupils try to find them all but to afford an easy means of naming those that may be brought in.[2]

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[1] Aquaria may be cheaply made from glass jars, large bottles or carboys, cut off, or better with double thick window glass set with aquarium cement into a rectangular frame of angle tin. A good size is 15 inches long, 8 inches wide by 12 inches deep. If a larger size is desired, angle iron for the frame is preferable. Cement may be bought ready made or may be mixed as follows: linseed oil, 3 oz.; tar, 4 oz.; resin, 1 lb. This is pliable and not poisonous. It should harden under water, if not, add more resin and tar. Cement for a salt water aquarium may be made with 10 parts (by measure) each of litharge, plaster paris and dry white sand, 1 part powdered resin, to be mixed as wanted, with boiled linseed oil, into a stiff putty. Bottom, as well as sides and ends, should be made of glass. All attempts to use wood for the frame or any part of an aquarium will result in leaks and annoyance. Where they can be afforded, beautiful aquaria are at hand made of glass, cast in a single piece. Of the various shapes and sizes the rectangular aquarium (13 long, by 13 deep, by 8 inches wide, capacity 5 gallons, catalogue price, $6.00) made by Whitall, Tatum & Co., New York, is especially to be recommended for schoolroom use. For the setting and management of aquaria, see the Amateur Aquarist, by Mark Samuel. (Baker & Taylor Co., 5 E. 16th Street, New York.)

A vivarium need not be water tight; a simple glass, or wire screen box serving every purpose. A convenient size is 12 by 12 by 8 inches deep. It should be set with about two inches of earth in the bottom, which should be kept moist, not wet, and should have a small bowl of water sunk level with the earth in one corner. Fine moss may be used over the bottom and larger plants add attractiveness, but interfere with the observations.

[2] For more complete descriptions and classification, see Manual of the Vertebrates of the Northern United States, by David Starr Jordan.

Frogs *(Rana)*. Skin smooth; toes and fingers fully webbed; maxillary and generally vomerine teeth.

Leopard Frog, Common Frog *(R. halicina)*; greenish, dark spots in two irregular rows.

Pickerel Frog *(R. palustris)*, brownish, dark spots square in four rows.

Green Frog, or Spring Frog *(R. Clamitans)*, bright green, rarely brownish; blackish spots over back and sides; white below.

Bull Frog *(R. catesbiana)*, greenish olive with dusky blotches; a foot or more long when fully grown.

Wood Frog *(R. temporaria L.)* var. sylvatica (LeC.), reddish brown; dark band on each side of head through eye and ear; small; scarcely aquatic.

Tree Frogs *(Hyla)*. Small; arboreal; fingers and toes, with tips expanded into clasping discs.

Common Tree Toad *(H. versicolor)*. Green, gray or brown, with irregular dark spots; white or yellow below.

Pickering's Tree Toad *(H. pickeringii)*. Yellowish brown; dusky lines and spots often in form of cross above.

Anderson's Tree Toad *(H. andersonii)*. Dark pea-green above; sides with yellowish spots and purplish band on sides of head; N. J. to S. C., rare.

Cricket Frogs *(Acris)*. Small; not arboreal; found in wet woods and on aquatic plants; length 1½ inch.

Cricket Frog *(A. gryllus)*. Brown above, with bright green band along middle of head and back; a dark triangle between eyes, and a white line from eye to ear; three oblique blotches on sides.

Toads *(Bufo)*. Jaws toothless; skin generally warty. Genera 3, species 30; found in all parts of the world except Australia.

Common Toad *(Bufo lentiginosus*, variety of northern form *Americanus* (LeC.). Very variable; adults warty; young almost smooth.

Besides the frogs many newts, tritons, efts and other salamanders may be brought in. These are all harmless, interesting creatures, however viciously some of them may pretend to snap; valuable insect destroyers for the localities they inhabit. In hav-

ing these animals returned, for the present, to their homes, the teacher may call attention to the fact that they are like frogs, except for their tails, and like the tadpoles of frogs and toads, after the legs have grown out and before the tail has been absorbed.

For a time, then, we may have specimens of frogs, tree toads and toads in the school room for the children to study and observe. Language and drawing lessons may be grouped about them so as to direct the pupils' attention to the points of similarity and difference, in form, color, size and markings, on the one side, and in their activities, leaping, climbing, swimming, methods of catching food, chirping, croaking, trilling, etc., on the other ; so that in the end the children will know the different species, and be able to recognize each at sight or on hearing its characteristic note. As soon as this is accomplished all the frogs and tree toads should be returned to the ponds and woods, and undivided attention should be given to trying to read the life story and discover the life work of our common toad. We may follow this most conveniently in connection with the natural history of the animal.

The toads spend the winter in a torpid state in the ground. The first warm days of spring wake them up, and the date when they are first seen should be noted and recorded each year in the "nature calendar" of the school.[1] (April 12, 1897, March 28, 1898.) If taken in the hand at this time they often utter a very soft, low, musical trill. In the evenings this may sometimes be heard in connection with the rustling of dry grass and dead leaves, which tell us that the toads are moving in a body toward the nearest pond. (April 25, 1897.)[2]

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[1] This is a point of great importance, since thousands of toads are destroyed with great suffering in burning leaves and rubbish every spring. Common humanity demands that this should be done, whenever possible, before the toads come out of the ground. All dates refer to observations made in Worcester, Mass.

[2] A few toads were found trilling a little in a particularly well-sheltered pond as early as April 16. The night of April 25, 1897, the general movement occurred, and their cheerful trilling could be heard on every side. In the morning hundreds of toads were found in the water trilling and seeking mates. No eggs were laid up to six o'clock of the evening of the 25th ; but on the morning of the 26th the bottom of the pond was covered, in many places inches deep, with the eggs, and, by far, the greater part

EGGS, EGG LAYING AND TADPOLES.

The eggs of the toad are about the size of a pin's head, black on one side, and are laid in single rows in a transparent jelly. They look like a string of black beads, and this arrangement serves to distinguish them readily from frogs' eggs, which cling together in irregular masses. The eggs are fertilized in the water, i. e., just as they are being laid. Four strings are ejected from the oviducts at once, which, at first, are scarcely larger in diameter than the egg itself, and the eggs lie almost touching one another in the string. After exposure to the water, the gelatinous envelope swells to about the diameter of a slate pencil, at the same time elongating so as to space the eggs equally and hold them some distance apart in the string.

Pupils should be encouraged to bring toad's eggs to school, where they can be kept in shallow dishes and allowed to hatch.

Just the best method of raising the tadpoles remains to be discovered. In the writer's experience thus far, he has tried to simulate conditions found in ponds where the tadpoles are seen to be doing well. It may be observed that they keep close to the shore, which would seem to indicate that a shallow dish should be used, not more than four or five inches deep. The bottom should be made of mud and gravel from the edge of a fairly clean pond with green algæ and water plants to keep the water well oxygenated. It is better to have this bottom slope up to the surface of the water on one side, so that the little tadpoles may find any depth of water they prefer, and crawl out into the air when they wish. With such an aquarium well "balanced," i. e., plants enough to oxygenate the water and furnish food, and animals enough to eat surplus and decaying vegetation, it will only be necessary to add water from time to time to keep it from drying up. The algæ and growth of slime which forms on the bottom and on the leaves and stems of the water plants furnish the natural food of the tadpoles. Bits of bread, raw fish or meat may be added to their diet once in three or four days, being careful to remove any uneaten particles before they foul the water.

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of the toads had finished laying and left the water. A few were found laying, however, during the morning. I mention the above to show how short a time the toads spend in the water.

At the discretion of the teacher the process of egg laying may be demonstrated in the school room. For this purpose a pair of toads may be taken from a pond, before they lay, and placed in a clean aquarium (or in an ordinary bucket) without sand or plants in it, but with a stone rising to the surface of the water for the toads to rest on. Male and female are readily distinguished, the female being larger and greatly distended with eggs. If but one pair is kept in the aquarium, the entire laying of a single toad may be easily obtained and when all are laid, measure and weigh both the toads and the mass of eggs. Weigh also both toads before egg-laying commences. The results will prove interesting. The eggs may also be counted, or a few hundred counted, these weighed or measured, and the number in the entire cast estimated. Two such layings yielded the writer the following results:

Spawn of medium-sized toad (71.5 gm.), counted, 7,587.
" " " " estimated, 8,000.

A nest counted, by an acquaintance, contained over 11,000 eggs, and, if placed in a single string, would have measured 93 feet in length. These enormous numbers of eggs have a great significance in understanding the natural history of the toad. Since they do not increase perceptibly in numbers from year to year, it is plain that, on the average, only two toads live to maturity, of all the 100,000 or more eggs laid by a pair. This will lead to a most instructive series of lessons on the natural enemies of the toad during the different phases of its life history. But little is known in this field. The writer has not found any fishes or frog tadpoles or insects that eat the eggs. But the tadpoles from the time they hatch until they leave the water are preyed upon by water beetles and dragon fly larvae, newts, possibly fishes. Almost the entire hatching of a pond may be destroyed in this way. It is possible that ducks may destroy both the eggs and tadpoles, but the point has not been studied so far as the writer knows. Ducks, hens, insectivorous birds and snakes eat great numbers of the tiny toads as they emerge from the water, and many species of hawks and owls, crows and snakes, feed largely upon the adults. Besides their natural enemies, in a town or city, many are killed by wheels of vehicles, lawn mowers, and many more are trodden under foot and burned in rubbish.

The great numbers of eggs would make it possible, if the necessary conditions of successful culture on a large scale could be discovered, to increase almost indefinitely and very rapidly the population of toads in any given region. If any district is infested by insect pests, and we know of no district which is not, and if the toad feeds upon the insect, and we know of but few insects that a toad will not eat, enough toads could undoubtedly be raised in less than five years' time to effectively rid the district of insects. In his report on the gypsy moth (1896, p. 404), Professor Fernald writes: "The common garden toad (*Bufo lentiginosus americanus*, LeC.), was, this year, found by Mr. Kirkland to be devouring great numbers of the caterpillars in infested brush lands. Stomach examinations of three toads, taken in such a place, June 6, 1895, showed them to contain, respectively, seven, fifteen and sixty-five gypsy moth caterpillars or the remains of the same."

Tadpoles are known as the "best scavengers" of aquaria. It would be difficult to keep an aquarium clean without them. An important series of observations and experiments should be directed to this point. The pupils should arrange two aquaria or dishes, as much alike as possible, setting them up just alike, as they would for raising tadpoles, and then put tadpoles in one and not in the other, and carefully note the results from day to day. This experiment may be varied in many ways. Bits of meat or vegetable matter may be placed in both, in varying amounts, to ascertain about how much material of this kind the tadpoles are able to scavenge. And parallel with this the children should be led to observe the ponds, where they may see tadpoles swarming around and devouring dead fishes and frogs, or other matter that would otherwise render the water impure. As point after point is gained, the problem of keeping the ponds or park waters in the neighborhood sweet and clear may be developed by questioning the pupils and leading them to reason from their observations.

LIFE AND WORK OF THE ADULT TOAD.

On June 3 (1897), one of the teachers[1] reported that the tadpoles in her school were "done" as the children expressed it, and the pupils were in an uproar of glee over the event, and all wanted

[1] Miss Emma M. Plimpton, Principal of Elizabeth Street School, Worcester, Mass.

to know what to feed the little toads with now. Of all things in natural history it would be hard to find anything that fascinates children in so many ways as these tiny just "done" toadlets. They are so droll, so comical, so brownie-like with their very slender arms and legs and their plump little bodies. They should be fed on newly hatched insects, gnats, red spiders, plant lice, etc., which can generally be found in abundance at this time, and in feeding the insects should be brushed from the leaves and disturbed so as to move about, since, like the adults, the little toads will only take food that is in motion. Their time of quitting the water should be correllated with a study of the condition of insect life on the land at that season.

While the eggs and tadpoles are being studied, adult toads should be kept in the school room, or the children may be encouraged to provide places about their yards at home where their work can be observed at odd moments. Do toads feed before going to water to lay their eggs? This is one of the first questions to receive attention. In other words, when do they begin to feed in the spring? A question, related to this naturally, though at the other end of the season, is: When do they cease feeding in the summer or fall? Hundreds of interesting and important questions center about, and are contained in, the general question; What does the toad feed upon?

Is there any slug, worm or insect, however hairy, or spiny, or prickly, poisonous, bad smelling or so generally disagreeable that a toad will refuse to take it? And how many of each kind can a single toad be depended upon to destroy?[1] How many house flies can a toad consume daily? How many mosquitoes, which

[1] A good beginning at answering a few of these questions has been made by Mr. Kirkland, the results of whose studies may be found in Bulletin 46 of the Hatch Experiment Station, entitled: "The Habits, Food and Economic Value of the Common Toad."* A list is here given of the insects found in 149 toads' stomachs, and from one item, the cut worms alone which a toad destroys, Mr. Kirkland says, at an estimate which gardeners will probably consider ridiculously low, "We find that in one season a toad might destroy cut worms which otherwise would have damaged crops to the extent of $19.88." But this is not a matter for gardeners and country life alone.

*To obtain this Bulletin, address, simply, Hatch Experiment Station, Amherst, Mass.

hide about the grass by day, and make life a burden and sleep an impossibility by night, will the little toads take care of? How many rose beetles, canker worms, ants, tent caterpillars, white marked tussock moths, fall web worms, june bugs, army worms, currant worms, weevils, snails and a hundred other pests will this harmless and useful little animal keep within bounds? These are all questions of real importance to every home, country or city. The writer has watched a toad snap up 86 house flies in less than ten minutes. No doubt a toad with his home under the door-step will relieve a family of at least this number daily, and possibly many more, of these troublesome pests which constantly seek entrance to the house. And this will make no small item in the comfort of a city family through the hot summer. As to rose beetles a Worcester teacher[1] has sent me the following interesting note. . . .

"One day I gathered a quantity of rose bugs in a tin box, sat down in the shade beside my queer pet and began feeding the bugs to him. At first I did not count, but finding his appetite so good, I started to count. When I had counted over 80 bugs and the toad showed no signs of wishing to conclude his meal, I picked him up. He evidently took a miff at the liberty and hopped off. Previous to my beginning to count, he had taken anywhere from 10 to 20 bugs. He was quite a large toad, but the bugs were large too, and very 'scratchy.'"

It would be interesting to know how many he would take the day after such a meal. So, too, in a house a room may be cleared of cockroaches by leaving a toad in it over night.

Let the class, then, take up the problems in this field which happen to present points of the greatest local interest and importance. Let the pupils bring in from day to day the most troublesome insect pest about their homes, and count the number that a toad will eat. Then let them apply the knowledge thus gained to making conditions such that toads can render a like service in the home garden or grounds or about the house.

In the matter of devising ways and means of keeping the toads at home encourage the children to use their ingenuity. Let it be made a good natured contest in invention, here also grouping their language and drawing lessons about it. Let them discuss

[1] Ellen M. Foskett, Principal Gage Street School, Worcester, Mass.

freely the merits of each device, and decide which is best adapted to serve its special purpose.

A part of a page in Mr. Kirkland's Bulletin is devoted to "How the Toad may be made Useful;" but his treatment is directed too exclusively toward agricultural or horticultural uses. Greenhouses, he tells us, may be freed of snails, myriapods, rose beetles and other pests, and gardens cleared of insects, but the matter deserves much broader study and treatment. The simplest device for colonizing toads in a garden is, as Mr. Kirkland says, to "provide them with artificial shelters, made by digging shallow holes in the ground and partially covering them with a bit of board or flat stone." I have tried this with success, so far as the board shelters are concerned, but toads in my garden refused to stay under flat stones to any extent. I have found as many as four toads living under a single piece of board, while none could be found under stones similarly placed. Under different conditions of soil and more sunlight, it might be different. I have also tried the plan of making an enclosure of wire screen—a foot wide, two feet long and a foot high is a convenient size, the top of which may be left open or closed as preferred. If open, it is only necessary to put in two or three toads, provide them with shelters, a dish of water in one corner, and then keep it supplied with small bits of raw meat and any other refuse matter calculated to attract flies or other insects. Sugar solutions should not be used on account of the danger of attracting honey bees, which a toad will take in great numbers despite their stings. It is often stated that the toad feeds chiefly at night, but it was seldom that I did not find them in the day time as well sitting around the bait and snapping the flies as they came. If the top of the cage is covered, the bottom should be arranged on the principle of a fly trap, i. e., with a slit opening upward to the interior. This insures catching rather more flies. A bait, of course, simply placed in front of a toad's burrow, without any inclosure, often works well; but if the occupant has had good luck the night before, he may prefer taking his nap to catching flies. Any of these methods are infinitely superior to those usually adopted, which kill the flies after they have gained entrance to the house, viz., poison fly papers, or the inhuman sticky fly paper which we see so often in fly time. They are Nature's own methods.

For other insects special devices will be necessary. For nocturnal species a lantern placed on the ground might serve a good purpose at certain times of the year. The service of street lamps, and especially of electric lights, as insect collectors, is known and appreciated even by the toads themselves. If a few toads could be kept under rose bushes, grape vines, plum and other fruit trees, all the beetles and caterpillars that fall easily, when jarred, might be dealt with by shaking the bushes or trees at evening, and letting the toads do the rest. How effective any of these methods may prove must be left for experiment to decide. The fly traps were an undoubted success, even managed in the desultory manner which the many demands upon my time rendered inevitable. The scarcity of flies in a neighborhood, otherwise swarming with them, was a matter of unsolicited remark, and at times rendered window screens almost unnecessary. If some bright boy would watch such a fly trap, in the height of fly time, for a *whole day* and count the number of the pests that a single toad captured, he might give to the public a surprising statement of what nature, if assisted or even unmolested, is able to do for us in this line.

How can we get toads enough for our flower beds and gardens, is the next question? Not infrequently gardeners buy them, paying in England, as high a £5 a hundred, but their attachment to locality and evident powers of "homing" renders this method, even if it were advisable, not very effective. At best it amounts only to "robbing Peter to pay Paul." In a city, where surface breeding waters are for the most part filled or drained, the toads crowd together literally by the thousands in breeding season in such pools as remain, the ponds of parks, for example. These should be utilized to the full, managing them in such wise that as many of the eggs as possible may come to maturity. It would, in fact, infinitely enhance the beauty of park waters to have them kept clear and properly scavenged by the tadpoles. It might even be advisable to leave the banks sloping and the margins shallow in places to enable the toads to get in and out at laying time and the little ones to leave the water readily. But, utilized to the utmost, such waters will probably not keep up the needed supply in a city or town. Considering the great number of eggs and the proba-

ble ease with which they may be reared, the best method would doubtless be to have a small pool about the garden, where possibly some water lilies might be kept growing, and supply it in the spring with as many eggs as can develop in it. What this number is, for, say a square foot of water surface, some bright school child must tell us.

Let as many of the class as wish make a pool containing a square foot of surface and see who can raise the most little toads from it. Where the attempt is made to rear as many as possible in a small area, natural growth in the water will not probably furnish sufficient food; so that they will be obliged to experiment and discover the best artificial food for the purpose.[1] This will give wide range for ingenuity and must yield results of value.

OBJECTIONS TO THE STUDY OF THE TOAD.

In introducing this study the writer has been met with certain objections, and they should be fairly considered.

"However useful they may be," one teacher remarked, "a toad is such an ugly, disgusting creature, we never can use it in school." This is tradition, with which it is not worth while to contend. If any feel that way, let them seek to overcome it or pass the study by as it suits them best. Children are rarely, if ever, troubled by any such notions, unless they have been implanted by their elders, which is often the case. The toad is not a handsome animal, yet its eye is one of the most beautiful objects in nature. I have seen children, who turned from a toad in disgust, so attracted to it, when their attention was called to its eye, that they immediately wanted to take it in their hands to get a better look at the eye again. A like magic might be effectual in overcoming the repulsions of older people. On the other hand, the form and coloring of the toad have an important lesson to teach: viz., that of the adaptation of an animal to its surroundings and to its life. The toad looks like a lump of dirt. On the one side, insects must come close enough for it to capture them, so that a toad depends for its food on its resemblance to a harmless clod. On the other side, keen eyed birds of prey and snakes are contin-

[1] Bits of Spratt's dog biscuit seem to furnish a good food for fishes and for frog tadpoles. It might form the staple food in the rearing of toads. It should be fed in such quantities as will be eaten up clean daily.

ually seeking the toad for their food, so that its life again depends on being as inconspicuous as possible. These are important lessons which should not be overlooked, and, when their significance is appreciated, they may do much toward reconciling the fastidious to the homeliness of the toad. Its work in the world depends upon it.

All objections relating to warts being caused by handling toads are mere figments of imagination. Practically, the same may be said about the supposed poisonous character of the animal. When roughly handled the glands of the skin exude a whitish fluid, which may cause smarting in a cut, as will the slime on a fish, or cause some swelling of a dog's mouth. In the first place, they should not be handled roughly. In the second, no case of serious poisoning has been reported.

A third objection to toads in cities, as stated by an acquaintance of the writer, is that it is so "disagreeable to step on them while walking about at night." Rather than exterminate the toads, which my friend suggested as a remedy, I should prefer to carry a small lantern.

But, finally, why waste time studying toads? A number of reasons present themselves, among them the following: In the first place, it is the commonest animal we have. It costs nothing for specimens. They are practically at every child's door. Second, they are apt to be grievously abused by the children, and experience has shown that a little instruction of the right kind wholly does away with this, making the children its most sturdy protectors. Thus the study can be made to yield the best kind of moral culture. Third, the life history of the animal, its transformations, from egg to tadpole, from tadpole to toad, are easily observed, and the movement is sufficiently rapid to be exceedingly fascinating to children. And, finally, the life work of the toad is of great human importance, about which every one in the community should have a clear understanding. Aside from the bacteria, insects are the worst enemies of man. If Professor Riley's estimate be correct, viz., that insects destroy property in this country, annually, to the amount of $400,000,000, we should clearly learn and utilize every possible force in nature which is opposed to insect life. On that estimate, Massachusetts is proba-

bly taxed yearly by insect pests not less than $10,000,000. With the wide range of insect life constituting the toad's dietry, it is probably safe to say that this annual loss might be reduced one-half, if this one animal were properly understood and utilized by the people of the State. Even if it amounted to but one-tenth, this knowledge might make possible a clear saving to the State of $1,000,000 yearly. In addition to this much freedom from annoyance must result and greatly enhanced comfort of every household.

Referring to the prize offer, on last page, it is hoped that any one who makes an interesting observation will send it in, although they may not consider it of sufficient importance to stand a chance of winning a prize. And since this leaflet, as stated at the outset, is purely an experiment, correspondence, by way of practical suggestions and especially of adverse criticism, is cordially solicited by the writer.

PRIZE OFFER.

To promote this study the writer announces that at least two prizes will be offered for the best practical work by a public school child in the State of Massachusetts upon the following subject:

THE VALUE OF OUR COMMON TOAD.

First Prize, at least $15.00, to be known as the Massachusetts Woman's Club Prize (in grateful acknowledgment of the fact that part of the amount, $11.00, was placed in his hands for this purpose by the Executive Board of the State Federation of Woman's Clubs).

Second Prize, at least $10.00, offered by himself.

Papers competing for these prizes must be sent in to the undersigned on or before October 1, 1898. Awards will be made by a committee of Clark University, and the prizes announced not later than November 1, following. Each paper must be marked with a number, pseudonym or legend, which will not reveal the identity or even the address of the author, and must contain a sealed envelope bearing the same number, pseudonym or legend on the outside, and having within a card with the true name and address of the writer, and also the name and address of the public school teacher whose school the child has attended during the year.

All post marks will be torn off, so that none of the judges will know even the school from whence the essays come, until their decision has been reached, and then only the envelopes of the successful competitors will be opened.

The prizes will be awarded for the best original observations and the most ingenious devices and experiments of the children themselves. None of these, however, should include the killing of toads to make analyses of stomach contents, Mr. Kirkland's work being considered sufficient in this line. Besides this, a toad's stomach may be easily examined by gently opening the mouth and removing the entire stomach contents with a small wire loop, without causing the least pain or injury to the animal. But even this should not be necessary.

At first it was intended to send this leaflet free to all who wished it. But, personally, the writer is not altogether in favor of such free distribution of this class of literature. The principle at bottom is wrong, and enables publications to float which could not find distribution on their merits. All such had better be burned than inflicted on an innocent public, this among the rest. If it is not worth the price, the writer will be glad to learn the fact, and will cheerfully burn the edition, and try again. The price has been figured so as to bring in a small profit on probable cost of printing and mailing. If this amounts to enough, instead of the above stated figures, the prizes will be as follows: First, $25.00; second, $15.00; third, $10.00, and fourth, $5.00.

C. F. HODGE,
Clark University,
Worcester, Mass.

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ADDITIONAL NOTE. Feb., 1899.

Four essays in competition for the prizes were received from Massachusetts. The committee of awards met and, after careful examination of all the papers, decided not to award the prizes. This action was taken in view of the fact that none of the papers showed *original observations*, *ingenious devices* or *experiments*, the chief objects for which the prizes were offered.

Five essays were received from other States and Canada. One of these, while not written on the specific subject of the prize offer was deemed of sufficient merit to be given a gratuity of $5.00. Its title is "Toads and Frogs," by Margaret Hyde Beebe, aged 10 years, and daughter of Dr. R. C. Beebe, medical missionary at Nanking, China. We quote from it the following:

"Although many people despise the toad, it is a very useful animal, even more so than the frog. It is useful to gardeners, because it eats the insects that destroys the vegetables. The French people take toads to market and sell them to gardeners.

"Celia Thaxter was a lady who wrote good poetry about birds and flowers. She lived on an island on the Atlantic coast. She was fond of flowers, and would have had a fine garden, if the slugs had not bothered her. One day a naturalist was visiting her and she told him about her garden and he said 'Where are your toads?' She answered him 'I have never seen a toad on this island!' So he proposed that she send for some. So she wrote to a friend that lived in the country in Massachusetts and asked her to send her some toads. In a few days a box came to her by express and when she opened it there she saw three homesick, tired, hungry toads on top of some dry earth. She turned the hose on the contents of the box and was surprised to find, when she took them to the garden and turned them out of the box, that ninety toads hopped out. Celia Thaxter never had any more trouble with the slugs, and her garden prospered. Toads had not travelled to her island before this, because they cannot live in salt water."

I am sure others, besides the writer, will be grateful to Margaret for this story. It has been decided, further, to throw open the prizes upon the same conditions as for last year *to all public school children in the United States*, extending the time to which papers may be sent in, to *November 1, 1899*. Pupils should also keep very clearly in mind that the subject is "VALUE OF OUR COMMON TOAD;" not its natural history or pretty stories about it; and the prizes will be won by the best statements of the best *observations* by the children themselves, bearing upon the work which the animal does for the community.

The statement regarding the poisonous nature of the toad, needs some modification, a case having been called to my attention (by courtesy of Mr. A. B. Eadie, of Ithaca, N. Y.,) of a child poisoned by having the secretion from the glands of the toad's skin, "spurted" into its eye. As they certainly possess no means of ejecting or "spurting" poison, this must be interpreted as an argument against smashing toads, with, possibly, an added caution to wash the hands after handling them.

During the past summer toads were raised successfully by the thousands according to the method outlined on p. 13. A few fresh water mussels added to the water were found to assist greatly in keeping the breeding pools clear of floating algæ. Where many tadpoles are raised in a small pool an abundance of water plants should be kept growing in it.

It should further be added, under directions for raising tadpoles, on p. 6, that only such dishes as will not poison the water should be used. These are glass, earthenware, granite or agateware, wood and iron. Vessels of tin, copper, zinc, galvanized iron or lead or brass are likely to poison the water and kill all the tadpoles—thus spoil the whole experiment.

3814-7

NATURE STUDY LEAFLET.

OUR COMMON BIRDS.

SUGGESTIONS FOR

THE STUDY OF THEIR LIFE AND WORK.

BIOLOGY SERIES,
No. 2.

By
C. F. HODGE, PH. D.,
CLARK UNIVERSITY,
Worcester, Mass.

Food Chart and Drawings by
MISS HELEN A. BALL.

NOT STUFFED.

WORCESTER, MASS.:
PRESS OF O. B. WOOD.
1899.

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BIOLOGY OF OUR COMMON BIRDS.

By C. F. HODGE, Ph. D., Clark University.

Before genius is manliness and before beauty is power.

—*Burroughs, Birds and Poets, p. 173.*

A thing of beauty is a joy forever:
Its loveliness increases; it will never
Pass into nothingness; but still will keep
A bower quiet for us, and a sleep
Full of sweet dreams, and health, and quiet breathing.

—*Keats, Endymion.*

Cedar bird and nest.

Great human values, of power, of thought, of beauty, attach to a knowledge of our birds; and the larger science, biology, takes them all into account. In elementary and popular education, especially, this wider science should form the solid foundations for all our relations to bird life.

The important question is: What do birds *do* in the world? In striving to answer this question we should also consider what we can do for our birds to render their work as complete and effective as possible. We must first gain by observation and personal acquaintance with the living birds of each species a knowledge of their ways of doing things, their foods, their beauties and their songs. Then give the imagination full play to picture vividly before us what the whole species is doing in every farm and garden and about every home in the land. Think of the millions of beautiful wings and building nests and eating bills and singing throats. Aside from their

Think, every morning when the sun peeps through
The dim, leaf-latticed windows of the grove,
How jubilant the happy birds renew
Their old, melodious madrigals of love!
And when you think of this, remember, too,
'Tis always morning somewhere, and above
The awakening continents, from shore to shore,
Somewhere the birds are singing evermore.

. . . . . .

The summer came, and all the birds were dead;
The days were like hot coals; the very ground
Was burned to ashes; in the orchards fed
Myriads of caterpillars, and around
The cultivated fields and garden beds
Hosts of devouring insects crawled, and found
No foe to check their march, till they had made
The land a desert, without leaf or shade.

—*Longfellow, Birds of Killingworth.*

intellectual and æsthetic values the paramount service of the birds lies in their power to destroy insects. For this great work we have a vast mechanism in nature, an army plastic almost as air, on wings, powerful and beautiful, able to carry their literally flying squadrons hundreds and even thousands of miles whither food abounds and insects threaten destruction to vegetation.

In studying living things we should bear constantly in mind this great truth, stated often in the words: "As long as there is life there is hope." In everything that lives there are infinite possibilities. No seed is so tiny but that it may hide the possibility of covering the whole world with plants of its kind. Instead of mourning the loss of our forests, let us go to work. With a single living pine seed, properly cared for by man, we may cover the continent in an incredibly short time with a forest of pines. A pair of living bird's eggs, with proper care by the children of the country, could produce in ten years a pair of birds for every child in the land. Let us consider for a moment the possibilities that lie hidden within the blue shells of a pair of robins' eggs. Allowing that ten young robins may be produced by a pair each year, with the life of a robin as ten years, we shall have.

1st year,	(2 + 10)	12 robins.
2d "	(12 " 60)	72 "
3d "	(72 " 360)	432 "
4th "	. . .	2,592 "
5th "	. . .	15,552 "
6th "	. . .	93,312 "
7th "	. . .	559,872 "
8th "	. .	3,358,232 "
9th "	. .	20,149,392 "
10th "	. .	120,896,352 "
50th "	1,616,400,000,000,000,000,000,000,000,000,000,000,000.	

A bird came down the walk:
He did n't know I saw;
He bit an angleworm in halves,
And ate the fellow, raw.

And then he drank a dew
From a convenient grass,
And then hopped sidewise to the wall
To let a beetle pass.
—*Emily Dickinson, Poems, p. 140.*

The winds blow east, the winds blow west,
The blue eggs in the robin's nest
Will soon have wings and beak and breast,
And flutter and fly away.—*Longfellow.*

If we do not have all the robins we want, and this applies to any living thing, it is because we do not know enough about rearing them or are not willing to act in accordance with our knowledge.

In addition to this infinite power of multiplication we must never lose sight of another great law of biology, viz.: that every living thing possesses great possibilities of development and improvement. No one has yet produced the best and most beautiful rose or peach or bird or

man or anything else, that the world is capable of yielding. By proper care we can not only have a world full of such birds as we have now, but of birds with sweeter and sweeter song and more and more beautiful plumage. And in presence of these infinite possibilities for good or for ill we must above all things remember that every human action tends to make the world a garden or a desert, a paradise of joy and beauty or a vale of tears.

To produce and multiply endlessly, without ever reaching the last possibility of excellence, and without committing herself to any end, is the law of Nature.
—*Burroughs, Birds and Poets, p. 180.*

If only the birds we have, felt that they and their nests were safe, they might sing more and even sweeter than they do. Indeed, Burroughs remarks of English birds: "They sing with more confidence and copiousness, and as if they, too, had been touched by civilization." They sing more hours in the day and more days in the year.[1] And, further, if our birds were uniformly safe in man's presence and undisturbed, they would doubtless come much closer to us, as they did to Thoreau, and to Celia Thaxter in her garden. And with proper care many of our best songsters and most useful birds that are now rare, might become more common, filling our parks and the thickly planted portions of our towns and even cities; and with much more caution than preceded the introduction of the English sparrow, we might bring about our homes the most beautiful songsters of other lands. But by far the safer and wiser course, as indicated by our title, will be to begin by making the most of our native birds. These are a heritage infinitely rich, developed through geological epochs to exactly fit all the conditions of life on this continent. It is no light matter to break into this vast living harmony, as our bitter experience with the English sparrow bears ample testimony.

Wood birds here are house and garden birds there (Eng.).—*Burroughs.*

Many haps fall in the field
Seldom seen by wishful eyes;
But all her shows did Nature yield,
To please and win this pilgrim wise.
He saw the partridge drum in the woods;
He heard the woodcock's evening hymn;
He found the tawny thrushes broods;
And the shy hawk did wait for him;
What others did at distance hear,
And guessed within the thicket's gloom,
Was shown to this philosopher,
And at his bidding seemed to come.
—*Emerson, Woodnotes, I, 2.*

With this wonderful power of increase the question naturally arises: Why do we not have many more birds than we find about us? Why have we not hundreds where we have but one? Has the natural

[1] Burroughs, Fresh Fields, p. 136.

limit of increase been already reached, so that attempts to increase the numbers would be useless? All such questions open up wide and important fields for observation and investigation. Food supply, for all seasons of the year, is the main factor in this great series of problems. This will be considered in a section by itself. The next great factors are natural enemies of bird life. In connection with each element in nature which tends to decrease our valuable bird life, we should endeavor to discover the best means of preventing its operation. That this matter is now a national exigency, in the careful study of which every patriotic citizen and every school child should participate, may be duly appreciated by referring to William T. Hornaday's recent paper[1] on the Destruction of our Birds and Mammals. We learn from this that during the past fifteen years our birds have decreased in thirty states and territories 46%. For each of the states named this decrease has been as stated in table. Three states,—North Carolina, Oregon, and California, show neither increase or decrease; and only four states,—Kansas, Wyoming, Washington and Utah have had an increase of bird life. It would be a most worthy ambition to infuse into our school system, reaching, as it does, the life and heart of every child, the purpose and the will to exert every effort to change this destructive process to one of increase, as rapid as possible, in every state and territory, in every county, farm, and city lot of the land.

What thou art we know not;
What is most like thee?
From rainbow clouds there flow not
Drops so bright to see,
As from thy presence showers a rain
of melody.

Teach us, spright or bird,
What sweet thoughts are thine;
I have never heard
Praise of love or wine
That panted forth a flood of rapture so
divine.

Teach me half the gladness
That thy brain must know,
Such melodious madness
From my lips must flow
The world should listen then, as I am
listening now.
—*Shelley. To a Skylark.*

Maine	52%
New Hampshire	32
Vermont	30
Massachusetts	27
Rhode Island	60
Connecticut	75
New York	48
New Jersey	37
Pennsylvania	51
Ohio	38
Indiana	60
Illinois	38
Michigan	23
Wisconsin	40
Iowa	37
Missouri	36
Nebraska	10
North Dakota	58
District of Columbia	33
South Carolina	32
Georgia	65
Florida	77
Mississippi	37
Louisiana	55
Arkansas	50
Texas	67
Indian Territory	75
Montana	75
Colorado	28
Idaho	40
Average	46

Climatic influences are severe in this country. Great numbers of birds are killed in heavy rain and hail storms. Whole species are

[1] William T. Hornaday, Director of the N. Y. Zoölogical Park. The Destruction of our Birds and Mammals. Second Annual Report, N. Y. Zoölogical Society. N. Y., 1898. Office of the Society, 69 Wall Street.

decimated in times of sleet and in extraordinarily cold weather within the range of their southern migrations. Thus our bluebirds were killed off in 1895, and fearful havoc has been wrought in a number of our most valuable species in the Southern States during the past winter.[1] With these elements it is difficult to contend. To what extent man is responsible by reason of clearing out natural shelter and destroying natural food supplies it is impossible to say. Again, in times of great drouth in regions where our common species breed, both food and water may become so scarce that numbers of nestlings famish or starve. The birds then are loth to desert their nests to go to regions of plenty. If birds were tamed sufficiently to come to man as their friend in times of great need, as they do in rare cases now, and as they learned to come to Mrs. Brightwen, a little food and shelter might tide them over the hard time, and their service afterwards would repay the outlay a thousand fold. About the house and barn and shade trees, safe places of shelter, crannies arranged on purpose, bird houses, due care being exercised to keep them clear of English sparrows and place them out of the reach of cats, might save great numbers of birds yearly.

Millions of fledglings, the country over, now go to feed vagabond cats. The remedy here is to rid the neighborhood of all such cats; and people who have cats that they value, for love of nature ought to see to it that they are provided with other food than young robins, orioles, thrushes and song sparrows. Much can be done by way of training cats to let the birds alone, and lastly they should be kept in as much as possible at times when young birds in the neighborhood are learning to fly.[2]

In recent years regions have been almost depopulated and whole species practically exterminated for purposes of millinery. The fault here does not rest, as is generally charged, with leaders of fashion or with our good lady friends who wear birds' skins on their hats, but rather with public education and with the ornithologists themselves who know better uses for birds, and who ought to adequately instruct the public instead of scolding and preaching at it.

---

[1] See the Auk for April, 1899, note by Arthur T. Wayne, p. 197.

[2] Prof. Forbush states that a cat is generally responsible for about fifty song birds in a year, and one cat to his knowledge destroyed six bird's nests in a single day.

Juvenile collectors of birds' skins, eggs and nests, and careless sportsmen, also stand in need of genuine education. The schools can easily reach the children of the country, and they in turn can carry most potent influences into the homes. Teaching can be made positive rather than negative at every point, can impress the great values attaching to living birds, and set the children actively to work rearing, protecting and taming them, and then stuffed birds and empty egg shells will have very little attraction.[1] The rule used to be that a boy might "take one egg" from a nest. This may not be so bad, where there is only one boy. But boys have multiplied and birds have decreased, hence few eggs are left for the birds, especially about our towns. For a city or town it may not be unwise to have a reference collection of birds' skins, nests and eggs common to the locality; but even here the greatest care is necessary to prevent its furnishing incentive for boys to make similar collections of their own, or supplying excuse for all manner of robbing, any and every boy bringing in "for the Natural History Museum" any and every nest he can find. Collecting, if done at all by killing live birds and eggs, should be done by responsible persons who are capable of realizing that a live bird may be worth a hundred dollars a year to a community; and that all the infinite possibilities for life and action, song, beauty and usefulness are flown when the bird is shot or the egg is blown.

English sparrows are responsible for much decrease among certain of our native birds, especially the most desirable species about our cities and towns. This is the great obstacle that completely blocks the way of doing anything for our native birds. If we put up bird boxes, plant and procure trees for shelter and nesting places, provide food and water, the sparrows will "mob" any bluebird, wren, martin or swallow, drive off, break up the nests and devour the eggs of our robins, catbirds, song sparrows and vireos, and all our trouble will

[1] In the Upsala Street School, Worcester, Mass., Miss Mary C. Henry, Principal, with a devoted corps of teachers, has been putting this theory to practical test. The boys and girls, to a child, from the primary to highest grade, have been working enthusiastically for protection and increase of birds. The bird census for the second year showed an increase in number of nests of 30%, and people in the neighborhood say that it is for the first time in their memory fit to live in, i. e., free from juvenile vandalism. The children in this school have brought in birds found dead, and these have been mounted, when suitable, for the school collection. This is a legitimate way in which to make collections, if such are desirable.

result in increasing the numbers of this "ruffian in feathers," a bird "too pestiferous to mention." It has been computed that in ten years a single pair of sparrows might increase to 275,716,983,698. What are we to do with this enemy of our valuable native birds? So many differences of opinion and so many delicate points of morals and pedagogy are involved in answering this question that all we can say is let every child study and observe the facts, and with the permission of parents do everything possible to exterminate the sparrows about the premises and neighborhood. It was a dark day for the birds as well as for the people of this country when the English sparrow was introduced. If, instead, a general and well concerted movement had been organized to protect our native species and give them a fair chance to do the work of insect destruction for which our natural conditions had developed them, the country might have been a long way on the road to becoming a paradise.[1]

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[1] Bulletin No. 1, The English Sparrow, U. S. Dep. Agriculture, ought to be readily accessible for reference to every class in nature study. Methods of destroying sparrows that involve suffering, wounding, etc., should be avoided so far as possible. The same is true of methods which advocate destruction of "nests, eggs or young, which I regret to find are favored by the Department of Agriculture. Among the many arguments against this method we may say that a nest is a sacred thing, except to collectors, and its deliberate destruction violates our finest sentiments of home and confidence. I know of cases where the people advocate the merciful extermination of sparrows out of nesting time, but will not allow a nest to be disturbed under their own roof. Recent opposition to attempts to rid Boston of the English sparrow by destruction of "eggs, nest and young" is history in point. I am also obliged, on biological grounds, to differ from the Bulletin on the point of protecting carnivorous birds, like the sparrow hawk, shrike, and screech owl, because, since English sparrows are so shy and cunning, these birds will be feeding largely on the more easily caught native birds which we wish to protect. And further, if they did kill English sparrows in great numbers, in proportion as these become scarce, more and more of our valuable song birds must be taken, until we shall be obliged to make war on the hawks and shrikes.

Practical directions for poisoning sparrows are given on page 174 of the Bulletin, and of the poisons recommended arsenic is least painful as well as best adapted on other accounts. "As an early symptom of arsenic poisoning," Dr. Hare says, "all sensation of pain produced by heat or pinching totally ceases." Poisoning is certainly the most humane and effective method at our disposal, and by its use any northern town or city can easily rid itself of sparrows during a single winter, if a few intelligent friends of our native birds in different parts of the city will take the matter in hand. Those who, in spite of all the evidence in hand, continue to think the English sparrow worthy of protection, should keep them in cages in their own houses and be placed under heavy bonds never to let them out.

THE BIRD CENSUS.

Chickadee.

Scarcely any one line of nature study carries so many interesting and important features as that connected with actually keeping track of the number of birds in a neighborhood with a view to increasing the more desirable species in every way possible. The best method of making a bird census is to count the nests in a certain district as soon as the leaves fall in autumn.[1] People generally would find it interesting to do this for their city lots or door yards, and if they would send the results from year to year to their local bird club, to some bird magazine, or to the writer, most valuable data might be gathered as to the hoped for increase of our native birds in different parts of the country. It is helpful for

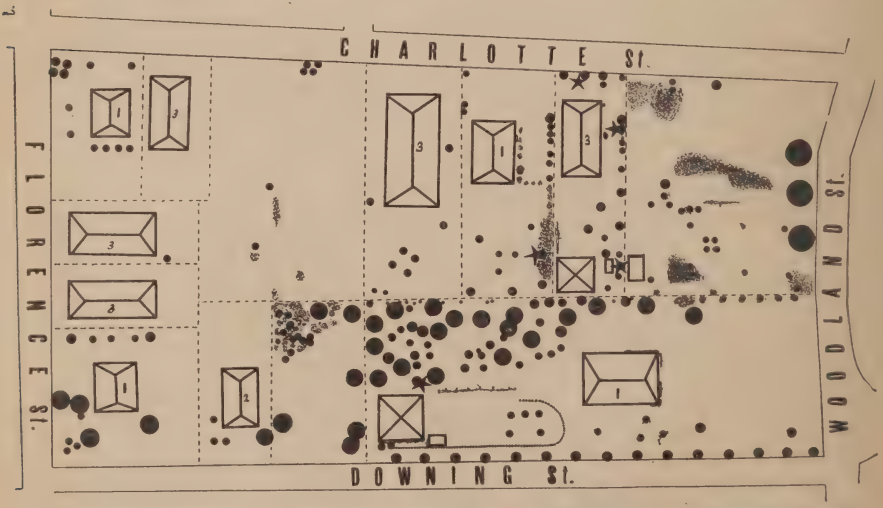
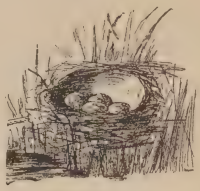


Chart and census of a city block, Worcester, Mass., for 1898. Stars indicate nests, viz., two robins, one oriole, one chipping sparrow, and one downy woodpecker. Trees, houses and brush are appropriately indicated.

Apple	5	Maple—one robin	42
Ash, Mountain	2	Oak	55
Birch	13	Peach	5
Cherry	9	Pine, etc.	95
Chestnut—one woodpecker	29	Pear—one robin, one oriole	38
Elm	5	Plum	7
Hickory	4	Others	6
Hawthorn—one chipping sparrow	1	Total number of trees	316

[1] I take pleasure in acknowledging for this valuable suggestion my indebtedness to Professor Frank M. Chapman.

schools, as well as being good geography work, to make a chart or map of the district, with each house, tree, hedge, vine, bush and thicket given its proper place. The separate counting of each kind of tree gives the children a good reason for learning the different species, and, if any bird shows preferences for particular trees, this fact will be brought out. Essays and language lessons may be devoted to discussions and descriptions as to the kind of places the different birds choose to nest in. Drawing should be combined with this, and each schoolroom might contain, either in a case or, possibly even better, hung about the walls and windows, a collection of deserted nests. These the pupils could use for special drawing work and to study as to form and structure, methods used by the birds in building, and materials employed and preferred. Knowledge on all the above points will come to hand in a succeeding section, when we consider especially methods of attracting the birds and of providing for their needs. And surely nothing in all ornithology is better fitted to instill in a child the spirit and the love of bird life than the study of their wonderful nests. If the children were given a course in such study during February or March they could hardly be induced, I should think, to molest a bird's nest the following season.



Song Sparrow.

Bluebird.

THE FOOD CHART.

A great deal of information, giving at a glance the essence of years of study and hundreds of pages of bird books, has been collected by Miss Ball into the two pages of the chart. We can see for the various birds, so far as is known, just what the species does for man, and what, in turn, we may do for the birds, by way of insuring for them an abundant and inexpensive supply of their preferred foods. Birds have been persecuted and slaughtered for generations because they have been compelled to levy toll in cultivated fruits for their invaluable services. I say compelled, because we have, hitherto, paid

no attention to the natural sources of food supply for our birds, and, in clearing the land, have destroyed, often unnecessarily, the native trees and shrubs upon which they depended. It is now well known that birds much prefer wild to cultivated fruit and that to protect our fruit the most effective and humane way is to leave or plant such wild or valueless fruits as ripen at the same time. In coming to realize how recklessly the country has been stripped, the writer considers it bad biology to even put scarecrows in his cherry trees, to frighten the birds from his garden,[1] until we have planted wild cherries, mulberries and June berries for the birds to feed on. We can find plenty of other things to eat, while the birds cannot. All farms and many gardens and city lots have room for some tree or trees which would furnish food for birds. Our city streets, school yards and public parks might be planted with some regard to this matter most profitably, since in addition to adding pleasing variety it would tend to fill our towns and even cities with our native birds. No less an observer than John Burroughs says: "Indeed the food question seems to be the only serious one with the birds. Give them plenty to eat and no doubt the majority of them would face our winters." And he goes on to describe how a pair of bluebirds and even a mocking bird were induced, by the shelter of his porch and the fruit of a hackberry tree that stood close by, to spend the winter with him eighty miles north of New York. With available room properly planted we might easily have ten wild birds to one that we have now in our towns and even many of our cities. And those who favor the English sparrow because he is the "only bird we have in winter," might soon be consoled abundantly for his absence.

Baltimore Oriole.

The little bird sits at his door in the sun
Atilt like a blossom among the leaves,
And lets his illumined being o'errun
With the deluge of summer it receives;
His mate feels the eggs beneath her wings,
And the heart in her dumb breast flutters and sings.
He sings to the wide world, and she to her nest,
In the nice ear of Nature which song is the best? —*Lowell.*

Vireo.

[1] Damage to garden fruits by birds is a matter about which we may be greatly mistaken. I have four large cherry trees about the house, and robins have swarmed in them in cherry time; but I have little evidence that they

FOOD CHART OF OUR COMMON BIRDS.

	Per Cent. Animal Food	Per Cent. Vegetable Food	ANIMAL: Caterpillars	Beetles	Grasshoppers Bugs	VEGETABLE: Spiders-Millipeds Ants	Cultivated Fruit	Wild Fruit	Grain	PESTS: Noxious Weed Seed	Mosquitoes	Gypsy Moth	Canker Worm	Potato Beetle	English Sparrow	Elm Beetle	Cut Worm	Tent Caterpillar	Cocoa Cherry	Black Cherry	Elder berry	June berry	Virginia Creeper	Dogwood	Viburnum	Mountain Ash	Strawberry	Bittersweet	Hackberry	Barberry	Pokeberry	Cedar	Frost Grape	Barberry	Spicebush	Buckthorn	Green brier	Juniper	Wild Grape	Holly	Hawthorn	Blueberry	Huckleberry	Bush Cranberry	Partridgeberry	Sarsaparilla	False spikenard	Cucumber	Blackberry	Mulberry	Mast
BLUEBIRD	75	25	10	28	2	22	6	8	9	18					+							+		+		+	+	+		+	+	+						+	+		+			+	+	+	+	+	+	+	+
ROBIN	50+		8			9	+	+	-5	45					+					+		+	+	+	+	+	+	+	+	+	+	+		+	+	+			+	+	+							+	+	+
WOOD THRUSH			+	+		+	+					+			+													+				+						+										+	+
BROWN THRASHER	63	35	8	28	2	12	5	7	11						+					+			+	+			+										+													
CATBIRD	44	55	5	14	2	4	10	4							+					+			+	+			+										+	+												
HOUSE WREN	98	1	16	22	12	25	4	14							+					+																														
CHICKADEE			+	+	+	+	+								+	+					+																														
VIREOS			+	+	+	+									+																																				
CEDAR BIRD	12		+	+		+		+								+			+	+		+	+	+	+		+	+			+		+	+	+	+								+		+	+		
SWALLOWS				+		+	+							+																																					
TANAGER			+	+		+		+																																										+		
SHRIKE						+							+				+																																			
R'S-BR'ST'D GROSBEAK						+									+		+																																	+		
CROW	26			+	+	+					+		+							+	+	+	+	+		+	+	+			+	+	+			+			+	+		+	+	+	+				+		
BLUE JAY	24	76	+	11		+				11	+				+								+	+																							+					42
REDWING	26	74	+	+		+					13	57								+																															+		
GRACKLE	70	25		+	+	+	+	+				+			+								+	+			+			+																			+		+
ORIOLE	84	16	25	+	+	+	+	+				+								+	+		+		+																								+	+	
MEADOW LARK	72	28	+	+	+	+	+	+				+								+				+																										+		
BOBOLINK	37	63	7	13		8	5				21*	36																																							+		
KINGBIRD	90	10	+	+	+	+	+	+							+	+				+		+	+	+		+	+					+	+	+		+	+				+	+						+	+	
PHOEBE	88	12	+	+	+	+	+	+							+			+																																	+		
BLACK-BILLED CUCKOO	100		47	7	6	30		4							+		+				+																														+		
DOWNY WOODPECKER	75	25	16	24	4	+	23	3							+									+	+	+		+				+																		+	+	
HAIRY WOODPECKER	68	32	21	24	+	+	17	+							+							+	+	+	+	+						+		+		+												+	+	
FLICKER	59	41		10		+	43								+							+	+	+	+	+					+	+	+		+		+	+											
RED-SHOULDERED HAWK						+	+						+																																							
MARSH HAWK						+							+																																							
SCREECH OWL			+			+							+				+		+																																		
ENGLISH SPARROW	11	89	2	3		1	+	+	*4		75	10						+																																			

*Rice.
†Green Peas.

FIGURES in all cases express percentages of the food indicated obtained from analysis of stomach contents.
CROSSES indicate that the particular food forms a part of the bird's diet.

This chart was prepared from bird literature, largely from the reports of the Department of Agriculture, by Miss Helen A. Ball, and was first published by the Brewster Ornithological Club for use in the Worcester Schools.

It would be splendid nature study if all the children in our schools would learn this list of trees, shrubs, and plants. By learning them I do not mean being able to say over their names merely; but they should be able to recognize each at any season of the year; they should know its possibilities of growth for purposes of decoration and ornament; and, most of all, they should study how to propagate each species, so that they can actually plant and have any species anywhere they wish.

Glancing down the first column of the chart we see that certain birds subsist on animal food, insects, worms, etc. These birds are the house wren and cuckoo; and, when it is determined, we may add to this list almost certainly the chickadee, vireos, swallows, swifts, martins and flycatchers. We could not well have too many of these in our insect bepestered country. Another larger class of birds take 50% or over of animal food, but even with the others, as well stated by Wood (Theodore Wood, Our Bird Allies, p 7,), birds that take but a small per cent. of insect food may still destroy insects which would have damaged fruits and crops much more than the birds themselves. Birds that come early, like the bluebird, robin, redwing, and grackle, may be of especial service by destroying insects before they have laid their eggs for the season. A small per cent. of insects to a bird's credit at this time may mean a great deal before the season is over. But, of course, insect destruction is only one of the reasons why we should protect our birds, and there are many others.

For two years now the food chart has occupied a place on the wall of my study. I have had occasion to refer to it many hundred times, and never without learning something that I was glad to know. Still its best service, after all, lies in showing us how little we know about the foods of our birds. Each blank square is really a question, a suggestion to try this or that, and an infinite number of other things not mentioned in the chart, to see whether any particular bird will

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have taken much more than the wormy cherries. The charge is often made that they pick holes in the ripest, finest cherries; but may not these be just the ones that have grubs in them? Last year the way the robins behaved was most interesting and suggestive. They literally stormed the trees by dozens before the cherries were fairly ripe, just as the first premature, wormy cherries were turning red; but after this, for three weeks, while the fruit hung rich and black, I did not see a robin in the trees, and the cherries were remarkably free from worms.

eat it; to find how well they like it. And when a child finds that any bird will eat something which it is not shown to eat in the chart, he may have discovered something which no one else in the world knows. If it be some destructive insect, his observation may be very valuable, and if he tells everybody about it he may lead people to protect the bird more carefully, and so help to *make the world better.*[1]

As years go by and great numbers of our birds become so tame that they will come to us and eat from our hands and allow us to observe them as they hunt their natural foods and feed their young, we may be able to really discover more in this important field, in possibly the next ten years, than man has learned in the 10,000 years preceding. The method of studying living birds in the schoolroom can be made to greatly assist in this work.

BIRD STUDY IN THE SCHOOLROOM.

Natural history is taught in infant schools by pictures stuck up against walls, and such like mummery. A moment's notice of a redbreast pecking at a winter's hearth is worth it all.—*Wm. Wordsworth, letter to J. H. Rose.*

BIRD HOUSES.

Designed and made, at suggestion of Principal J. Chauncy Lyford, by ninth grade manual training pupils, Winslow Street School, Worcester, Mass. The bird house is now adopted as one of the regular models in the ninth grade manual training course throughout the city.

Wordsworth would have had even less patience with the stuffed caricatures of bird life that we now have in the schools, and he possibly would not have had such contempt for our modern pictures of birds, photographs from life, and reproductions in color. Of the two I certainly feel that the picture in most respects is preferable; and this opinion has been strengthened by the testimony of a number of teachers who say that they do not think the effect of stuffy deadness on the children is wholesome, and that in some cases, even little children

[1] If any such observations are made, it is specially requested that they be sent in to Miss Helen A. Ball, Worcester, Mass., No. 43 Laurel Street. It is hoped to greatly improve and enlarge the food chart from year to year, as we learn more and more about the food of birds, and it is safe to say that a new copy will be sent to all who contribute information. In this way we may also gather information as to the food of a species in different parts of the country as it has never been done.

protest against this themselves. Pictures stimulate the mind and help the child to see things in real bird life. Stuffed specimens either disgust children with the subject or tend to furnish incentive for them to kill birds and rob nests in order to make collections for themselves. Birds are far too valuable in every way for this, and all teaching should be directed toward so developing knowledge and love of living birds as to completely overwhelm their museum instincts.

An incident which may be told in a few words has suggested a method of bird study which would seem to present great possibilities for good. Last September I picked up a young cedar bird that had fallen in the grass, so gorged with wild cherries as to be unable to fly. I took him in the house, thinking only to keep him a day or two, until his wings grew strong enough to escape prowling cats. During this time, however, he became so tame, seemed so happy and contented, so companionable and withal suggested so many interesting and important problems, as to bird taming, study of bird foods, bird study in schools, etc., that it was decided to retain him for other uses, and now as I write this he is sitting contentedly on my shoulder preening his feathers and tinkling his delicate little "whisper songs" into my ear. Methods of taming birds will form a section by itself. Interest in food problems began by noticing that he very soon began catching flies on the window pane. A net full of flies was brought in and he took 78, all there were, as fast as they could be given him, and then ate poke berries for dessert. The food chart was of great assistance in showing just what the cedar bird is known to eat. Besides the foods indicated on the chart, however, he was found to take cabbage worms, edema larvæ, flies, ants, fall web worms (a little sparingly), bush cranberries. No attempt was made to follow up the matter, as my time was occupied with other things. It serves to demonstrate how easy it may be for a child to discover things of real importance in bird life about him.

The bird was taken first to the zoölogy class in the high school. The pupils ransacked the city for insects with which to make feeding tests, and hunted especially for elm beetles in order to discover how many of these pests a cedar bird could consume in a day. For a time in the late summer elm beetles were abundant and in certain localities did considerable damage to the foliage. The cedar birds also appeared in numbers and this may account for the fact that practically no elm beetles could be found by the class in September and October. The

cedar birds and phœbes are the only birds on our food chart which are known to destroy the elm beetle, and it is quite possible that they have rendered this service, at least in Worcester, in their own quiet way. If this be so, it is certainly better than steam spray pumps and large appropriations of money could have done and the people should know and value their benefactors accordingly. But there were no end of other insects found and tested and the teacher, Miss Goddard, reported that the pupils "seem to think it great fun and the scheme seems to be working much better than I thought possible, when you suggested it. The little cedar bird seems well and happy and his appetite for flies seems to have returned again. He refused them for a day or two after his arrival. He looks so wise, we call him the professor."

After "teaching" thus in the high school the bird was sent the rounds of the kindergartens. Here he was often given the freedom of the room, flitting from child to child and feeding from their hands. The children took delight in bringing food and made little excursions to hunt berries, "so the bird could have some dinner." Miss Rood, the teacher of one of the kindergartens, has kindly noted down for me the children's sayings and points of general interest. "One little girl was so afraid that she would cry if the bird came near her ; but she soon became so fond of him that her first question in the morning was whether he might not be let out of his cage. A very little girl said : 'He flies around us so as to know us.' A little boy said : 'He likes us 'cause we like him.' He pecked at our hair and the children let him, saying : 'He must have some hair to build his house with.' After he left us the children asked every day for a week for him. When I said, perhaps we could take him again, they asked me : 'Will you ask the man to-day. Ask him, *please*, may we take him?' 'Ask him, can we keep him a long time ; for he loves us?'"

Thousands of young birds every year leave their nests a day or two before their wings are quite strong and fall an easy prey to cats. I wish every child might be taught to keep a sharp lookout for such unfortunates and whenever found, protect them for a few days, until able to fly. They may be simply placed in a cage near the nest and often the old birds will continue to feed them. If not, they should be fed and watered regularly about every hour during daylight until they become able to help themselves. As to retaining them in captivity longer than necessary for their own safety, no better rule can be fol-

lowed than that of Olive Thorne Miller, which is, to liberate a bird as soon as it becomes evident that it is not possible to render it happy and contented. With careful observation of this rule common objections to caged birds fall to the ground, and it would seem that a few of each species might serve a higher purpose than that of food for cats if they were tamed so as to be happy and companionable, and brought into our schools to teach the children, from actual life, all their calls, notes, and songs, their habits and manners, and beauties of plumage and action, all about their foods and their possibilities for destroying insect pests. And we might even have them building their nests and rearing their broods on the window sills. This may seem impossible; but many of our common birds will nest in captivity. Suppose we have a pair of robins. If fed well and supplied with a crotch and material for building, they would doubtless build their nest, and if, after the eggs were laid, the whole were set outside the nearest shady window and securely fastened there, they might be given their liberty and would rear their brood under the eyes of the whole school. What stories might be read in this way from real bird life. In a few years birds might be flying into our open windows to sing to us, as they did for Mrs. Brightwen.

TAMING OUR WILD BIRDS AND ATTRACTING THEM TO OUR HOMES.

He is so tame he never stirs from his twig for anybody, no matter how near a person may come; he alights on arms and hands and hair unafraid; he rifles the flowers I hold when I am gathering them, and I sometimes think he is the very most charming thing in the garden. I shall never forget the surprise of joy that filled me when one for the first time alighted on my sleeve and rested, as much at home as if I were a stick or a harmless twig. Sparrows and nut-hatches had often alighted on my head as I stood musing over my flowers, perfectly still, but to have this tiny spark of brilliant life come to anchor, as it were, on anything so earthly as my arm was indeed a nine days' wonder. Now it has grown to be an old story, but it is never any less delightful.—*Celia Thaxter, An Island Garden, p. 111. Description of her humming-birds.*

Let but a bird—that being so free and uncontrolled, which with one stroke of the wing puts space between you and himself—let him but be willing to draw near and conclude a friendship with you, and lo, how your heart is moved! No one can be insensible to the claim which confidence imposes; it is, so to speak, a freeman's right. The stork of the north builds its nest on your roof, and everybody envies you, and seeks the same favor in the coming spring. The swallow of the south makes our open house her own, and joy enters with her; her presence is a promise of happiness.—*Mme. Michelet, Nature, p. 39.*

Any one who can resist the monkey-like impulse to "grab" can easily tame a bird; at any rate, a young one. Birds' feathers are far too

delicate and beautiful to be handled with human fingers, and birds think too much of them and spend too much time combing and brushing and preening and washing and smoothing them to allow of their being roughly handled.

As a general rule in bird taming we should handle birds or rather allow them to handle (footle) us, solely by their feet. And when this rule is learned it is surprising how easily a bird may be induced to come to us and perch on our fingers. When all danger of their becoming frightened and fluttering is past, the hand may be gently closed over them and they may even enjoy being squeezed a little. My cedar-bird has reached this stage, at least when he is cold, and others have found this true; but it only applies to birds when they have become perfectly tame.[1]

Suppose we have a bird to tame, just how shall we go about it? We will place it in a clean cage, supply it with water and such food as the food chart may indicate for the time of year. We will be careful not to frighten it for the first day, while we study among its different foods the one it likes best. By the morning of the second day, when all the food in the cage

[1] The charming little story of taming a vireo, in Bird World (Ginn & Co., 1898, pp. 106,), and also Caroline Crowninshield Bascom's "Story of Little Billee." (Birds and all Nature, 1899, p. 49.) "He (Little Billee, a pet bird,) loves to visit my mother in her room, and is very happy while walking all over her, but she has never yet been able to touch him. He seems to have eyes all over his head, for no matter how careful she is, he always sees the finger. He thoroughly enjoys my squeezing him in my hand and kissing him over and over again."

has been eaten or removed, we will stick the favorite berry or insect on the end of a slender wand, it may have to be five or six feet long at first, and gently approach, until the morsel is in reach of his bill. If he takes it, try another, moving up a little closer. If not, let its appetite sharpen a little, or get a longer stick. By this method, and a little wholesome patience, any young bird can be tamed in three days to take things from your hand. With a pair of mocking birds, trapped birds and so wild that they would go into a frenzy of fluttering if I even entered the room, my first feeding was, mealworms on a stick, at six feet, my second at one foot, third, fourth and fifth, ditto, the sixth from the hand. Very soon I could simply place the worm on my table before me and they would boldly fly out of the cage and pounce upon it. But they are a proud, imperious bird, and always come toward me with wing raised ready to strike, with an expression of face which says, "I will eat you raw, sir, if you dare move a finger." And I pretend to be a little afraid of him, which is a bit of harmless deception. This latter trick is one I have used from childhood, and it is well described in the first chapter of Mrs. Treat's book, "Home Studies in Nature." The fact is there are a number of little knacks and tacts which it is difficult or unnecessary to describe. Perhaps the most important is with reference to the way we use our eyes when trying to tame a bird. Birds' eyes are probably much keener than our own, and they undoubtedly are able to read our faces. We must not stare and glare at them like cats or snakes trying to charm them. Glance at them pleasantly, then turn the eyes away, pretend to be looking or thinking about something else and their nervous tension is immediately relaxed. It is not considered polite to stare even at your friends.

The next step in bird taming is not generally a difficult one. Keep your bird's appetite sharp and healthy, and then find some food of which it is desperately fond. It was peppermint drops with my little cedarbird at first. With mocking birds, it is mealworms and spiders, and for robins, probably earthworms, and, according to Stickney, for vireos it may be black ants. When you have discovered it for your bird, you can soon have him flying after you from room to room, picking at your fingers or lips. Another little matter of tact is to have notes and calls, either spoken or whistled, and if possible, somewhat resembling the call notes of your bird, not the war cries or notes of alarm. Use these cheerfully on entering the room and while

feeding and caring for the bird. It is a sign of acquaintance when he begins to answer you back. Sometimes my birds will flutter violently when I enter the room, especially in a dim light, but cease instantly when the note of greeting and assurance is given. Birds in life make so much of notes and calls that they naturally play an important role in taming. This serves also as an excellent reason for learning bird notes and calls.

I give these hints in some detail, because I wish all children might be led to use them in their relations to birds, not only in confinement but especially out of doors, as well. Those who have not tried it can have no idea of the pure enjoyment, both for the birds and ourselves, which wait upon this kind of bird study. It is something that everybody can and ought to do. Bird collecting and skinning and stuffing is at best but sad drudgery, and I speak from dreary, though in many respects successful, experience. I hope almost enough of it has been done to last the country for the next thousand years, and what remains should be done by experts and the results should be preserved in moth-proof tin boxes in museums and not on exhibition; for scientific reference and not for show. Bird study afield or through an opera glass is at best for the few who have money and leisure. Like the flowers of our homes this kind of bird study, which aims to attract birds about our homes, should become part of our ordinary home life, an equal delight to parents and children, rich and poor, busy and idle, alike. Mrs. Treat has testified as to the satisfactions of such bird study as follows: "There is a keen sense of enjoyment — I might say, of exalted happiness — in being able to bring the free birds of the grove around one, which well repays for the time and patience and hermit-like life necessary to accomplish it." (Home Studies in Nature, 1885, p. 27.)

After four years of pleasure, "exalted happiness," we will not call it work, in attracting birds to her home she is able to report 27 nests on her lot, "several of them in close proximity to the house." Mrs. Treat has not "dropped" the study. Indeed, I doubt if any one really begins this study, that they ever could "drop" it. Under date of January 23, 1899, she writes me that twenty-five species have nested about her place. Of these she says, "The catbirds have become tamer than any other birds. I have had a pair so tame that they would eat from my hand and follow me into the house. The brown

thrush, too, has become very tame, bringing its young to the door to be fed. Song sparrows and chippies are also wonderfully tame."

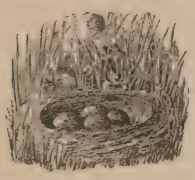
People buy birds and go to the expense and care of keeping them in cages. How much more is it worth to have a pair of free birds come and nest by your window, to have them sing to you the season through, and show you all the secrets of their family life and wonderful housekeeping. Four of my friends have kindly given me estimates as to how much they would be willing to give a year to have thus a pair of the following birds. We may compare the figures with Holden's prices for choice songsters of the same species.[1]

Bird.	Estimated Value.				Holden's Price.
	1st.	2nd.	3rd.	4th.	
Brown Thrasher,	$5	$3	$3	$8	$5 to $ 8
Catbird,	1	1	.75	1	5 " 10
Tanager,	1	10	3	4	3 " 5
Grosbeak,	1	8	7	8	5 " 8
Robin,	5	5	1	1	3 " 5
Bobolink,	2	10	6	8	2 " 3
Orioles,	6	4	3.50	3	5
Chickadee,	2	1	2	2	— —
Bluebird,	1	5	4	3	— —
Mocking bird (not thought of as a possibility),					3.50 " 50

The problem of attracting birds about our homes is one which might well interest every child and household in the land. It is a subject about which books do not tell us much, hence all the better calculated to stimulate ingenuity and imagination and reward every step with the delight of experiment and discovery. It is at bottom the problem of finding out all necessaries of bird life and supplying such as may be lacking. Food, water, and homes are the prime essentials. Insect food is generally superabundant, but may need to be supplemented at times, as already suggested. Excellent general directions

[1] I had hoped to place along side of the æsthetic value, the economic value of the different birds; but our highest authorities in ornithology tell us that this is not known for a single bird. If a toad may be worth $19.88 each season for cutworms alone which it destroys (Kirkland's estimate. The Common Toad, Bulletin No. 46, Hatch Experiment Station, Amherst, Mass.,), many of our birds, like the chickadee, swallow, wren, robin, and others, must be worth much more.

for this are given in Florence Mirriam's Birds of Village and Field, in connection with an account of Mrs. Davenport's interesting experiences with the "window shelf." A board by the window for crumbs and all sorts of bird foods appropriate to the seasons should become as much a household institution as the window garden inside, and promises to be a source of even more interest and pleasure. Here, again, the English sparrow is the great obstacle, but, with proper precautions and supervision, the window shelf may become a most efficient means of ridding our towns and cities of this most ubiquitous of pests.



Meadow Lark.

Water may be supplied by placing a shallow dish, always kept fresh and clean, on a short post under a tree, merely high enough up to be out of reach of cats. The water should not be more than two inches deep. Few people who have not tried it can have any idea of the satisfaction there is in seeing the thirsty birds come down to bathe and drink. For three years past I have had one by my study window, and at the present moment a robin is making the water fly in every direction. The next comer is an English sparrow, and the next and the next and the next two English sparrows, but while they are with us we should not wish them to be thirsty, and the next is a female robin, the next a red-eyed vireo, the next an English sparrow, all within fifteen minutes, and so it goes in the noon hour whenever I have time to watch. Nothing adds more to comfort of birds in hot weather.

To supply homes, nesting places, and materials for nests is a most fascinating study. Trees may be pruned to make inviting crotches, and a dark tangle of bushes overgrown with vines and sunflowers, dense lilac bushes or a "syringa thicket," will be sure to attract catbirds, brown thrashers and some others. Bird houses furnish homes for wrens, bluebirds, chickadees, tree swallows and purple martins, but here, again, English sparrows are the omnipresent nuisance and must be served frequent notice to quit the premises. The proper size for a bird house is six inches square floor space and eight inches high, and houses of more than one compartment may be made by cutting

Alas, dear friend, that, all my days,
Hast poured from that syringa thicket
The quaintly discontinuous lays
To which I hold a season ticket.

A season ticket cheaply bought
With a dessert of pilfered berries,
And who so oft my soul hast caught
With morn and evening voluntaries.
—*Lowell, Nightingale in The Study.*

the boards in multiples of these numbers. Old weathered boards should be used, or, if painted, they should be made the color of an old tree trunk. A single opening near the top should be made, two inches in diameter for most birds; although, for wrens and chickadees, one inch is sufficient and will serve to keep out the English sparrow, and for wrens they should be set in a shady place.

Both wrens and chickadees are most valuable birds. Besides being a cheery songster and a most sprightly and fascinating fellow, the wren depends for practically his whole food supply upon the insects of our grounds and gardens. While wrens have become quite scarce of late years about our towns and cities, driven out probably by English sparrows, a few of the children in Worcester have reported them as occupying their bird houses, and, no doubt, we may soon have them common again if we supply plenty of sparrow-proof homes and get rid of the sparrows. Probably no bird possesses a higher economic value than the chickadee. All summer he feeds on insects and all winter on the eggs which they lay on the twigs and bark and around the buds of trees. Professor Forbush reports finding 5,500 eggs of plant lice in the crop of a chickadee, this number representing what the bird had gathered for a single breakfast. When heavy snow and, especially, sleet covers the trees, be sure to see that your chickadees are provided with food. A fresh bone with marrow and meat on it, or a piece of suet fastened to the limb of a tree and kept free from ice from time to time, may save dozens of these precious little lives during a winter. Chickadees are also one of our cheeriest and tamest birds and we could not have too many of them about our homes.

Among the dwellings framed by birds
In field or forest with nice care,
Is none that with the little Wren's
In snugness may compare.
. . . . . .
And when for their abodes they seek
An opportune recess,
The hermit has no finer eye
For shadowy quietness.
—*Wordsworth, The Wren's Nest.*

This poet, though he live apart,
Moved by his hospitable heart,
Sped, when I passed his sylvan fort,
To do the honors of his court
As fits a feathered lord of land;
Flew near, with soft wing grazed my hand. —*Emerson, The Titmouse.*

Further on we found what we were chiefly looking for, a flock of lively little chickadees. . . . They would light on our hands, inspect the pieces of crushed nut, knock off the ones that did not suit them, and finally fly off with one, usually the largest. —*Floyd C. Noble, aged 14, Bird Lore, I, p. 58.*

On two occasions, chickadees have flown down and perched upon my hand. During the few seconds they remained there I became rigid with the emotion of this novel experience. It was a mark of confidence which seemed to initiate me into the ranks of woodland dwellers.
—*Chapman, Handbook, p. 390.*

Note also Chapman's The Legend of the Salt, Bird Lore, Vol. I, p. 55.

For swallows every barn, and, I am tempted to say, house attic as well, should be provided with a hole high up in the gables, which

can be left open the whole year, or, at least, all the time the swallows are with us. This is a custom of our fathers which should not be permitted to lapse. Old barns are sometimes seen with this wise provision, but it is seldom, if ever found in the new ones that are fast taking their places.[1]

Barn Swallow's Nest.

Gentle swallow, thou we know
Every year dost come and go;
In the spring thy nest thou mak'st;
In the winter it forsak'st,
And divert'st thyself awhile
Near the Memphian towers, or Nile.
—*Anacreon, XXXV, p. 89, Stanley's Translation.* (*B. C. 562.*)

The Indians, even, used to hang gourds to their wigwam poles for the martins.

As well suppose the trees without leaves as the summer air without swallows. Ever since of old time the Greeks went round from house to house in spring singing the swallow song, these birds have been looked upon as the friends of man, and almost as the very givers of the sunshine. . . . The beautiful swallows, be tender with them, for they symbol all that is best in nature and all that is best in our hearts.
—*Jeffries, Field and Hedgerow, p. 100.*

Then out of the high heaven above, at once one hears the happy chorus of the barn swallows; they come rejoicing, their swift wings cleave the blue, they fill the air with woven melody of grace and music. Till late August they remain. Like the martins, their note is pure joy; there is no coloring of sadness in any sound they make. The sandpiper's note is pensive with all its sweetness; there is a quality of thoughtfulness, as it were, in the voice of the song sparrow; the robin has many cadences; in the fairy bugling of the oriole there is a triumphant richness, but not such pure delight; the blackbird's call is keen and sweet, but not so glad; and the bobolink, when he shakes those brilliant jewels of sound from his bright throat, is always the prince of jokers, full of fun, but not so happy as comical. The swallow's twittering seems an expression of unalloyed rapture,—I should select it from the songs of all the birds I know as the voice of unshadowed gladness.
—*Celia Thaxter, Island Garden, p. 22.*

As the old barns fell to ruin,
New ones, raised to take their places,
Lacked the broad and generous shelter
Which the eaves had once afforded
To the owners of the mud huts,
To the swallows of the Saco.

Weary-winged, from distant Southlands,
In the spring have come the swallows,
Seeking hopefully their nestings,
Seeking eaves and sun-warmed barnsides;
Come and found the crackless clapboards,
Come and found ill-odored pigments,
Come and found new barns for old ones,
Come and found no eaves for shelter,
Come with joy and met with sorrow,
Seeking vainly for old barn sides
Changeless as the cliffs of Paugus.

Weary-winged, the homeless swallows
Flutter on into the darkness—
Whither going? That they know not.
But 't is certain that the Saco,
That the lonely cliffs of Paugus,
That the steeps below Chocorua,
Do not bear their cosy dwellings.
Years ago, on man depending,
Mother swallows taught their nestlings
Barns alone were made to build on—
Barns have failed them, man betrayed them.
—*Bolles, Chocorua's Tenants.*

[1] The nest in the margin was taken from such an old barn, with swallow holes in the peak, belonging to Elliott Moore of Worcester, and the swallows have nested in it regularly for many years. Paint and planed lumber are fast making our buildings impossible for swallows. A case has recently come to my knowledge, and they are doubtless numerous, where the nests of a large colony of eave swallows were scraped down in order to paint a barn. They deserted the place and have never returned. It would certainly pay to tack a *rough* board along under the eaves of barns to attract colonies of this most valuable bird.

The Greeks celebrated the swallows in poetry and song as early as the dawn of authentic history. We cannot afford to let these long, deep lines of poetry, sentiment and human good fail from our lives. I have heard complaints that our barn swallows are becoming scarce, as though it were due to some inevitable change in natural conditions. Look at our barns and the whole matter is explained. Provide *homes*, wherever this has been neglected, and they will soon be numerous again. It was indeed a pathetic thing to see, as I did recently, a fine colony of barn swallows flying round and round a large barn, examining every knot, clinging about the too well-glazed windows, unable to find an entrance. Farmers should realize the gallons of stock blood, and human as well, and the hot days of pestiferous suffering and annoyance from flies, gnats and mosquitoes which a beautiful colony of swallows would save.

> This guest of Summer,
> The temple-haunting martlet, does approve
> By his lov'd masonry, that heaven's breath
> Smells wooingly here. . . .
> Where they most breed and haunt, I have observ'd
> The air is delicate.
> —*Shakespeare, Macbeth.*

> All the summer long the swallow is a most instructive pattern of unwearied industry and affection. . . . The swallow is a delicate songster.—*Gilbert White, Selborne, 1767, p. 5, Vol. II.*

The purple martin has been practically driven from our towns and cities by the English sparrows. It should be considered no mean public service to keep a suitable house clear of sparrows for these beautiful birds; and it gives me rare pleasure to acknowledge my own debt in this matter to Mr. Loring Coes, of Worcester, who has, by dint of shooting several houses to pieces, retained a fine colony within the limits of our city. The bird house for purple martins should be placed on a pole some distance from trees and buildings, and the openings may be three inches in diameter.[1]

The little chimney swift and the night hawk are birds of wonderful power and usefulness in sweeping the air clear of insect pests. Both have applied for homes in our cities and should be most carefully

[1] It is often stated that purple martins are becoming rare, English sparrows being generally given as the cause. This is probably true in the main, since the sparrows nest before the martins come north, and especially because the sparrow nuisance has discouraged people from providing martin houses. That suitable houses for martins may be, however, at the bottom of the difficulty is indicated by the fact that a martin house, erected in Worcester, May 1, became within three weeks the home of seven pair of these "rare" birds. Within limits of food supply, we can doubtless have as many purple martins as we furnish with sparrow-free houses.

protected. The night hawks nest on the flat roofs of buildings and the swifts in unused chimneys. The swifts nest in colonies in the same chimneys and are often killed in great numbers by starting fires during cold weather in early summer. Great care should be exercised to avoid this whenever possible.

To one awakened at morning and cheered at evening by their songs through years of childhood, robins (not in pot-pies) are necessaries of life. No summer is complete without a pair of these rollicking birds nesting about the house. But how to induce a pair of wild robins to do this is a problem, most fascinating, but as yet almost wholly unsolved. I have tried putting up, in attractive crotches, imitation robins' nests, constructed of mud mixed with moss, twigs, grass, strings and rootlets (4¼ inches by 4 by 2 inches deep), but no robin has proved selfish enough to appropriate them. However, I had no robins' nests on the lot for three years; on placing two of these nests, a pair of robins did build *near* each. That was last season. This year, wishing to test the matter further, I did not place any imitation nests, and all the nests had been washed away by severe storms, and no robins have nested on the lot, although a pair has built not far away. Next year I shall try the dummy nests again. In very dry weather, or where mud is not easily obtained, it is a good plan to keep a pan of mud on the post with the birds' watering dish. Mrs. Treat has described how robins take mud for their nests from her flower pots, and Olive Thorne Miller relates that a female robin has been known to dip herself in water, fly directly into the dust of the street and then pick off the mud from her feet and feathers. When it comes to this, we may be sure that a little help will be appreciated. Several children in the Worcester Ten to One Clubs have put out pans of mud and have been greatly delighted in a number of cases by seeing robins come and carry the mud away. But I hope the one who first discovers how to make a nook so inviting that a pair of robins cannot resist the temptation to build their nest in it will tell me, and every one else, all about it.

It is almost as hard to do without orioles and vireos and a host of others, and if plenty of nesting material be provided at the proper

If every bird has his vocation, as a poetical French writer suggests, that of the American robin must be to inspire cheerfulness and contentment in men. His joyous "Cheer up! Cheer up! Cheery! Be cheery!" poured out in the early morning from the top branch of the highest tree in the neighborhood, is one of the most stimulating sounds of spring.

Besides admonishing others to cheerfulness, the robin sets the example. Not only is his cheering voice the first in the morning and the last at night,—of the day-birds,—but no rain is wet enough to dampen his spirits.—*Olive Thorne Miller, In Nesting Time, p. 2.*

time, it is perhaps easier to attract these birds than almost any others. They can build in almost any tree and find food in every garden and orchard. Hence abundance of nesting material, linen and cotton thread and strings, store twine, yarn or tow, may decide a pair to build on the spot. A little hair for a chipping sparrow is another thing not to be forgotten, and plenty of honeysuckles and other nectar-bearing flowers will be sure to attract humming birds.

A rout of evanescence
With a revolving wheel;
A resonance of emerald,
A rush of cochineal;
And every blossom on the vine
Adjusts her tumbled head—
The mail from Tunis, probably,
An easy morning ride.
—*Emily Dickinson, 2d Series, 130.*

Whatever we do to attract a pair of birds to nest on the premises must be done, of course, at the proper time, and to this end we should know especially when each species *begins to nest*, and our preparations should be made a week or two before this occurs. The following table, which we may call a Life Chart of a few of our commoner species, may serve to bring a number of points of interest together in convenient form for reference. It would be well if a table of this kind could be constructed each year by classes in nature study for each locality. This would bring out variations in season from year to year and define these periods more exactly, and so furnish incentive and guidance to active work of supplying homes and nesting materials and of saving the fledglings from cats. Here, too, the blank spaces under period of incubation and length of time the young remain in the nest form the most interesting part of the table, from the fact that any child with opportunity and a little patience may fill them in.

A flash of harmless lightning,
A mist of rainbow dyes,
The burnished sunbeams brightening
From flower to flower he flies.
While wakes the nodding blossom,
But just too late to see
What lip hath touched her bosom
And drained her rosary.
—*John B. Tabb, p. 59.*

LIFE CHART OF OUR COMMON BIRDS. (LATITUDE OF NEW YORK.)

	Arrive.	Depart.	No. of broods.	Begins to nest.	Incubation. Days.	Young remain in nest. Days.	Nest. Location.	Nest. Height Feet.	Nest. Material.	Eggs. Number.	Eggs. Color, etc.
Bluebird	A few resident Mar	Nov	2–3	Early May	12		Hollow in tree or box	4–10	Grass	4–6	Pale blue.
Robin	A few resident Mar	Oct., Nov.	2–3	May	12		Crotch of tree	5–15	Rootlets, grass, mud.	3–5	Greenish blue
Wood Thrush	May	Oct.	2–?	Late May	12		In sapling	8	Rootlets, mud, fine grass	3–5	Greenish blue
Brown Thrasher	Apr., late	Oct., late	1 or 2	May early			Low thick bushes or on ground	0–5	Twigs, rootlets	3–6	Greyish white, finely speckled with cinnamon.
Catbird	Apr., late	Oct., late	2–?	May early			Thicket or dense tree	3–30	Twigs, leaves, grass, rootlets	3–5	Dark greenish blue.
House Wren	Apr., late	Oct., mid	3	May early			Hollow tree, box or cranny	1–?	Twigs, grass	6–8	Wine or flesh colored, finely speckled.
Chickadee	Resident		2	May early			Hollow trees, birch stubs	4–20	Moss, grass, feathers, plant down	6–8	White, spotted and speckled with br'n.
Vireos	May	Oct., late	1	May early			Pensile in fork of branch	15–70	Bark fibers, paper, plant down	3–4	White, black spots on larger end.
Cedarbird	Resident		1	June–Oct			Fruit and shade trees	3–25	Twigs, bark, grasses, leaves, moss, rootlets	3–5	Pale bluish green, spotted with dark.
Swallows, Barn	Mid-Apr						On rafters, etc.		Mud, twigs, grass, feathers	4–6	White, spotted with brownish.
Swallows, Eve.	Apr.	Sept., mid.	2				ledges, eaves, holes in trees, bird houses		Mud, twigs, grass, feathers	4–7	White.
Swallows, Tree	Apr.	Oct.					Bird houses		Straws, twigs	4–5	White.
Purple Martin	Apr.	Sept., mid.					clear of trees		Twigs, weed stems, tendrils	3–4	Pale bluish or greenish white, brownish markings.
Tanager	May	Oct., early	1	Late May			Trees	3–20			Pale blue with brown markings.
Grosbeak	May, early	Oct., early	1				Bushes or trees	5–20	Fine twigs, rootlets	4–5	White, with dark scrawls and blotches.
Orioles	May 1	Sept. 1	1	Mid-May. Worc. 1899	14	14	Pendant from branches	8–50	String, hair, plant fibers	4–6	Greyish white, with brownish spots and blotches.
Bobolink	May	Oct., early	1	June 1			On ground, in in grass		Grasses	4–7	White, spotted with umber.
Kingbird	Apr., late	Sept., early	1 (2?)	May early	12–13	14	Trees	4–40	Weeds, grass, moss, plant down, rootlets	3–5	White, rarely spotted with brown.
Phœbe	Mar., mid	Oct., last	2	May early	12	14	On beams or ledges	6–20	Moss, mud, hairs	4–6	
Cuckoo, B. B	May, early	Oct., late	2	Mid-May			Low trees or vine-covered bushes	4 10	Sticks, grass	3–5	Pale bluish green.
Chipp'g Sparrow	Apr. 9	Nov. 7		Mid-May			Bushes and trees	5–20	Twigs, grasses, rootlets, hairs	4–6	Bluish, brownish markings.
Song Sparrow	Resident			May 1			On gr'nd, rarely on bushes		Grasses, dead leaves, bark	4–6	White, or bluish white, covered with brownish markings.

TEN TO ONE CLUBS.

Beloved of children, bards and Spring,
O birds, your perfect virtues bring,
Your song, your forms, your rhythmic flight,
Your manners for the heart's delight,
Nestle in hedge, or barn or roof,
Here weave your chamber weather-proof,
Forgive our harms, and condescend
To man as to a lubber friend,
And generous, teach his awkward race
Courage and probity and grace!

—*Emerson, May-day.*

No longer now the wing'd habitants,
That in the woods their sweet lives sing away,
Flee from the form of man; but gather round,
And preen their sunny feathers on the hands
Which little children stretch in friendly sport
Towards these dreadless partners of their play.
. . . . . happiness
And science dawn, though late, upon the earth.

—*Shelley, Daemon of the World.*

Anything that a man can avoid doing under the notion that it is bad, he may also avoid under the notion that something else is good. . . . Wean them (school children) from their native cruelty by imparting to them some of your own positive sympathy with an animal's inner springs of joy.

—*James, Talks to Teachers, Atlantic, 1899, p. 625.*

The relations which our child population shall assume towards our birds, and living nature generally, is a matter of tremendous national and educational importance. Personally I do not admit the evidence which is commonly adduced to prove "native cruelty" in children. But nothing is clearer than the fact that children are instinctively, incessantly, impulsively, explosively active; and, unless all possible channels of beneficent and delightful activity are laid wide open to them, it cannot fail to happen, as Goethe so well says, "Nothing is more terrible than active ignorance" (Nichts ist schrechlicher als eine thätige Unwissenheit"). My own experience with children and that kind of nature study which has some high purpose in it, which really presents to their minds something well worth doing, has led me to repudiate and anathematize as a libel of childhood theories of "native cruelty." These are the loose conclusions of that

desiccated breed of pedagogues who insist on setting before innocent childhood "asinine feasts of sow-thistles and brambles," grinds of minutiæ, technicalities and hard names, "abstractions of logic and metaphysics," "ragged notions and babblements, while they expected worthy and delightful knowledge." My experience has been that children always take to knowledge really "worthy and delightful," which offers full scope to their passion for activity, like ducklings to water, like fledglings to the air. If they do not, let us look to the "native cruelty" of our school courses, rather than cover our own stupidity with assumptions of "native cruelty" of childhood.

To put this matter again to the test, the subject of going actively to work rearing and protecting our native birds was presented to one of the Worcester schools. A brief statement was made as to the importance and need of the work and as to the pleasure of having birds about our homes. Practically, the questions then put to the children were: How many would like to have robins or orioles, or bluebirds, swallows or other native birds build their nests near their home? How many would be willing to do everything possible to protect such nests and birds? How many would like to band together, all work together for their neighborhood and have meetings to talk over best ways and means of helping the birds and attracting them about their homes? I must confess that even my own optimism was taken by surprise at the way the children tumbled into it. "Every child in every room in the building" was no uncommon report. Meetings were held at first after school hours once a week, but so many went into it and the work proved its value within a month to such an extent that by special notice of Superintendent Carroll, meetings of the Ten to One Clubs were made a regular part of the nature work and held in school hours. The name Ten to One Clubs was chosen, its significance being to work in every way possible to have ten of our valuable native birds where we have but one now. The first club was organized April 7, 1899, in the ninth grade of the Woodland Street School, Joseph Jackson, Principal. The second was formed the same day in the Upsala Street School. Officers were elected from among the boys and girls, and a simple constitution was framed and adopted. Since this gives the aims and organization, and may be of use to those wishing to form similar clubs, we append the constitution of the Woodland Street Club.

CONSTITUTION.

MOTTO: *Pro Avibus et Patria.*

ARTICLE I.

NAME AND PURPOSE.

SECTION 1. This organization shall be known as the Ten to One Club, Woodland Street School, Grade 9, Section A.

SEC. 2. The object of the club shall be to use every means possible to increase the numbers of our native wild birds by providing them, when necessary, with food, water, shelter and nesting places, by treating them with uniform kindness, and especially by protecting, in every way possible, their nests, eggs and young.

ARTICLE II.

MEMBERSHIP.

SECTION 1. Any pupil of the Woodland Street School may become a member by signing the constitution and working for the objects of the club.

ARTICLE III.

OFFICERS.

SECTION 1. The officers of the club shall be a president, eight vice-presidents, a secretary and four assistant secretaries and a committee of five on charts and statistics.

DUTIES OF OFFICERS.

SEC. 2. The duties of the president and secretary shall be those usually attaching to such offices.

SEC. 3. Vice-presidents and assistant secretaries shall perform the duties of their respective chiefs during their absence, or when the club meets in sections.

SEC. 4. The committee on charts and statistics shall make a map of a certain district, to be determined by the club, and keep a

record of the number of birds' nests reported, and the history of each nest, and shall make a report on said map and record at the last meeting of the club in June and November of each year, and at any other time that the club may direct.

ARTICLE IV.

MEETINGS.

SECTION 1. The regular meetings of the club shall be held on Friday afternoon of each week at 3.30 o'clock during the school year.

SEC. 2. Special meetings may be held at any time at the call of the president and secretary, with approval of the principal and all the teachers, during the school year, and if held in the school building.

SEC. 3. Ten members shall constitute a quorum.

ARTICLE V.

AMENDMENTS.

SECTION 1. This constitution may be amended by a majority vote of those present at any regular meeting, provided that notice of proposed amendment be given at a previous regular meeting.

BY-LAWS.

ORDER OF BUSINESS.

1. Minutes of previous meeting.
2. Reports of committee on charts and statistics (if called for).
3. Reports of special committees.
4. Reports of birds' nests newly discovered.
5. Records of nests previously reported.
6. Suggestions by members as to ways and means for protecting birds, nests and young.
7. Miscellaneous business.

The central idea in the formation of these clubs is to open up channels of beneficent activity which will lead the children, and their parents as well, to the fullest possible enjoyment of the birds about their own homes. It is applying to this field the magical logic that one positive action renders useless all the dull machinery of repression

and punishment. No child who has *done* something to attract birds to his home needs to be told not to do things intended to drive them away.

A brief list of things the boys and girls have actually done may be of interest. They have set out, about their school yards and their homes, a number of those trees, shrubs and plants given in the food chart as most valuable to attract birds and furnish food. This most important work of all is but just begun, but much interest has been aroused in it and the leaven is working. Numbers of children have made bird houses and done everything possible to attract birds to nest in them. In a few cases they have been successful, but they were carefully told at the start that there would not be birds enough to go around this year; that if everybody was careful to protect the nests and young, they might hope to have some another year. They have put out all sorts of nesting material, even to the clippings of their own hair, and have quite generally been delighted by seeing the birds carry it away. Dishes of water and pans of mud have been provided. Numbers of nests have been reported and means of protecting them have been adopted. A number of young birds have been cared for until able to fly and have then been liberated. Injured birds have been restored to health and liberated. Two members of one of the clubs ducked a boy who disturbed a robin's nest until he promised never to do so again. A very sad incident happened in the Elizabeth School Club, where one of the boys had found a loon's nest and had tamed the young so that he could feed them "wet bread" from his hand. This is a rare occurrence, and we began to hope that we might have a family of these most active and beautiful of our aquatic birds to enliven our park waters. Soon, however, the inevitable hoodlum came and shot both loons and carried off the young. One of the "hardest" boys in a school did not come in to the first and second meeting of the club. The third meeting he stayed and joined the club, and the fourth he had something to say about birds he had seen, and recently made the following report: He said that he was helping a farmer mow away hay and there were a number of swallows' nests in the barn. The man asked him if he would not climb up and knock them down. He answered the man, "We learn at our school that swallows are good birds and we have promised to protect their nests all we can, and, if you leave their nests alone, they will catch mosquitoes and flies and all kinds of insects for you and do your farm lots of good." The man

replied: "Well, I had n't thought of that; but I guess you are right, my boy, and we'll leave the nests where they are."

It was intended to introduce this work into one or two schools as an experiment, but soon other schools caught the idea and organized by a delightful sort of spontaneous combustion, until probably not less than 5,000 pupils joined the clubs, and practically every child in the city felt their influence for good.

A number of spontaneous expressions have come to me indicating a living, permanent interest, and we may feel assured that every life thus touched by the magic of positive love, thought, and action, has been "lifted up and strengthened:

> Knowing that Nature never did betray
> The heart that loved her; 'tis her privilege,
> Through all the years of this our life to lead
> From joy to joy: for she can so inform
> The mind that is within us, so impress
> With quietness and beauty, and so feed
> With lofty thoughts, that neither evil tongues,
> Rash judgments, nor the sneers of selfish men,
> Nor greetings, where no kindness is, nor all
> The dreary intercourse of daily life
> Shall e'er prevail against us or disturb
> Our cheerful faith, that all which we behold
> Is full of blessings.
>
> —*Wm. Wordsworth, Tintern Abbey.*